PV Inverter

SUNNY BOY 2500/3000

Installation Manual

SB25_30-IA-IEN111040 | IMEN-SB25_30 | Version 4.0

EN

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1 Information on this Manual

1.1 Validity

This manual describes the assembly, installation, commissioning, maintenance and failure search procedures for the following SMA inverters:

- Sunny Boy 2500 (SB 2500, SB 2500-IT)
- Sunny Boy 3000 (SB 3000, SB 3000-IT)

Keep this manual in a convenient place for future reference.

1.2 Target Group

This manual is for electrically skilled persons. The tasks described in this manual may be performed by electrically skilled persons only.

1.3 Additional Information

You will find further information on special topics such as designing a miniature circuit-breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual provided for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety instructions and general information are used in this manual:

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.

Information

Information provides tips that are valuable for the optimal installation and operation of your product.

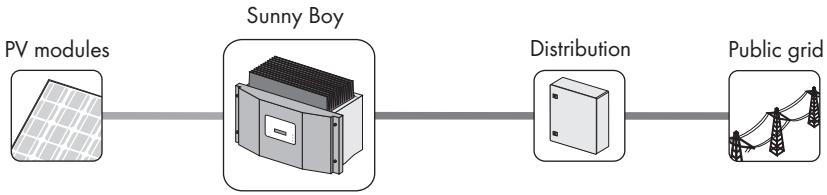
☑ This symbol indicates the result of an action.

2 Safety

2.1 Appropriate Usage

The Sunny Boy is a PV inverter which converts the DC current of the PV array to AC current and feeds it into the power distribution grid.

Principle of a PV plant with this Sunny Boy



The Sunny Boy may only be operated with PV arrays (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the Sunny Boy.

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy device. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Description "Module Technology" in the download area of www.SMA.de/en).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of component parts not expressly recommended or sold by SMA Solar Technology AG shall void any warranty claims and the operation permission.

2.2 Safety Instructions

DANGER!

Danger to life due to high voltages in the inverter.

- All work on the inverter may only be carried out by electrically skilled persons.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

- Do not touch the enclosure during operation.
- Only touch the lid during operation.

NOTICE!

Dust and water in the inverter can damage the device.

Once the Electronic Solar Switch has been pulled out, the inverter only provides protection rating IP21. The inverter is then no longer protected against water and dust. In order to also maintain the IP65 degree of protection during temporary decommissioning, proceed as follows:

- Unlock and disconnect all DC connectors.
- Open all DC connectors and remove the cables.
- Close all DC inputs with the corresponding DC connectors and the supplied sealing plugs.
- Securely attach the Electronic Solar Switch again.

Grounding the PV array

Comply with the local regulations for grounding the modules and the PV array.
SMA Solar Technology AG recommends connecting the array frame and other electrically conductive surfaces so that there is continuous conduction and to ground them in order to ensure maximum protection for plants and persons.

2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type label.

2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display. Indicates the operating state of the inverter.
	Ground fault or varistor defective. Read section 9.3 "Red LED is Glowing Continuously" (page 53).
	Fault or disturbance. Read section 9 "Failure Search" (page 49).
	Tap to switch on the display light and switch to the next display message.
	Electronic Solar Switch (ESS) DC load disconnection unit • ❶ When the Electronic Solar Switch is plugged in, the DC circuit is closed. • ⓿ To interrupt the DC circuit and disconnect the inverter securely under load, you have to first pull out the Electronic Solar Switch ❶ and then remove all DC connectors ❷ , as described in section 7.2 "Opening the Inverter" (page 42).

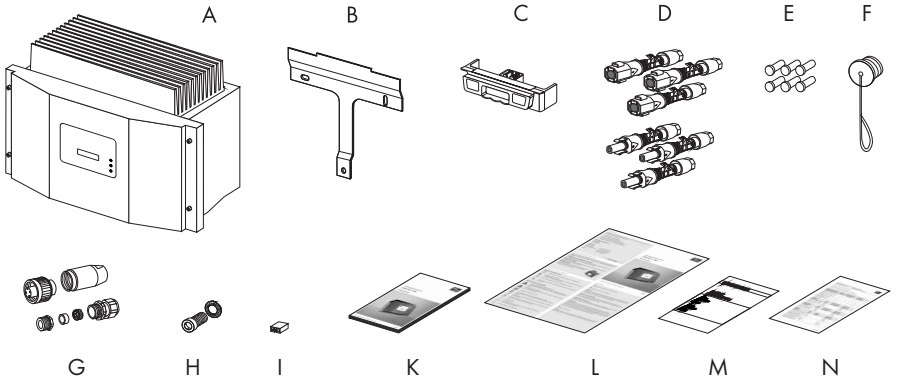
2.3.2 Symbols on the Type Label

Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by electrically skilled persons.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with household waste. For more information on disposal, see section 10.4 "Disposing of the Inverter" (page 59).
CE	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer.
	Direct current (DC)
	Alternating current (AC)
	Degree of protection IP65. The inverter is protected against penetration by dust particles and water jets from any angle.
	RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
	Australian mark of conformity.

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for any visible external damage. Contact your dealer if anything is damaged or missing.



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Electronic Solar Switch (ESS)
D	6	DC plug connectors (3 x positive, 3 x negative)
E	6	Sealing plugs for DC connectors
F	1	Protective cap for AC socket on inverter
G	1	AC connection socket: socket unit, threaded sleeve, pressure screw PG13.5, sealing ring PG13.5, fastening case PG13.5, cable gland PG16
H	1	M6x12 cylinder head screw and conical spring washer
I	1	Jumper
K	1	Installation guide
L	1	User manual
M	1	Set of documents with explanations and certificates
N	1	Supplementary sheet with inverter factory settings

3.2 Identifying the Inverter

You can identify the inverter using the type label. The type label is on the right side of the enclosure.

The serial number (Serial No.) and the type (Type/Model) of the inverter, as well as device-specific characteristics are specified on the type label.

4 Mounting

4.1 Safety

DANGER!

Danger to life due to fire or explosion.

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in areas with a risk of explosion.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

- Mount the inverter in such a way that the enclosure cannot be touched inadvertently.

CAUTION!

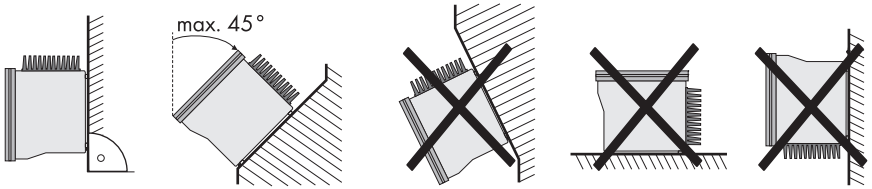
Risk of injury due to the heavy weight of the inverter.

- Take the inverter's weight of approx. 32 kg into account for mounting.

4.2 Selecting the Mounting Location

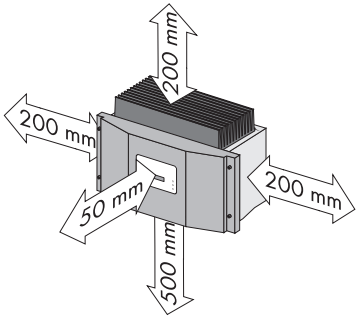
Consider the following requirements when selecting the installation site:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 11 "Technical Data" (page 60)).
- Mount on a solid surface.
- The mounting location must at all times be clear and safely accessible without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.



- Mount vertically or tilted backwards by max. 45°.

- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never install the device with a sideways tilt.
- Do not mount horizontally.
- Install at eye level in order to allow operating states to be read at all times.
- To ensure optimal operation, the ambient temperature should be below 40°C.
- Do not expose the inverter to direct sunlight, as this can cause excessive heating and power reduction.
- In a living area, do not mount the unit on plasterboard walls (or similar) in order to avoid audible vibrations. When in use, the inverter emits noises which may be perceived as a nuisance in a living area.
- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram in order to ensure sufficient heat dissipation and sufficient space for removing the Electronic Solar Switch.



Multiple inverters installed in areas with high ambient temperatures

If necessary, increase the clearance spaces and make sure there is enough fresh air supply to ensure sufficient cooling of the inverters.

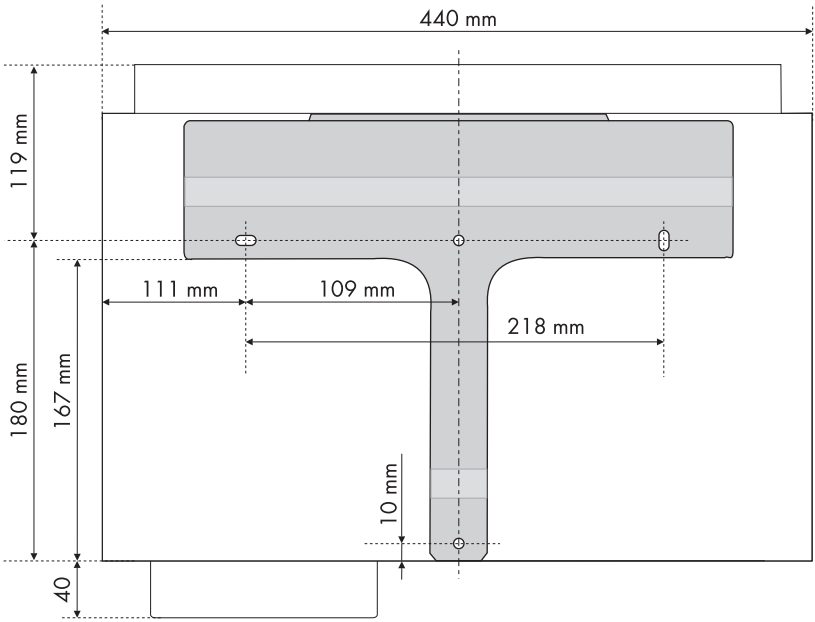
4.3 Mounting the Inverter with the Wall Mounting Bracket

CAUTION!

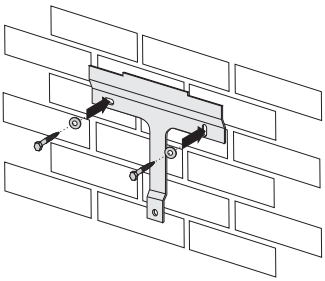
Risk of injury due to the heavy weight of the inverter.

- Take the inverter's weight of approx. 32 kg into account for mounting.
- Use mounting material suitable for the surface when attaching the wall mounting bracket.

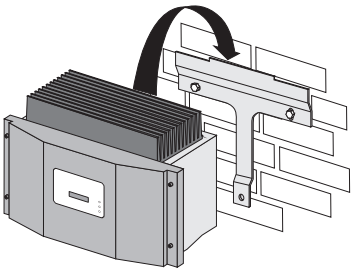
1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.



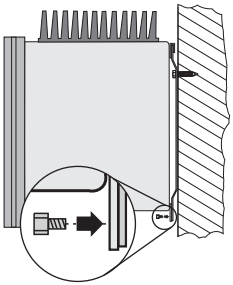
2. Attach the wall mounting bracket to the wall using appropriate screws and washers.



3. Mount the inverter with its upper fastening plates on the wall mounting bracket in such a way that it cannot slide out of the bracket sideways.



4. If a second protective conductor is required in the country of installation, ground the inverter and fix it securely, as described in section 5.2.3 "Connecting Additional Grounding" (page 25).
5. If a second protective conductor is not required, fix the inverter securely using the enclosed M6x12 screw.



6. Check to ensure that the inverter is securely in place.

☑ The inverter is now mounted to the wall.

5 Electrical Connection

NOTICE!

Electrostatic discharges can damage the inverter.

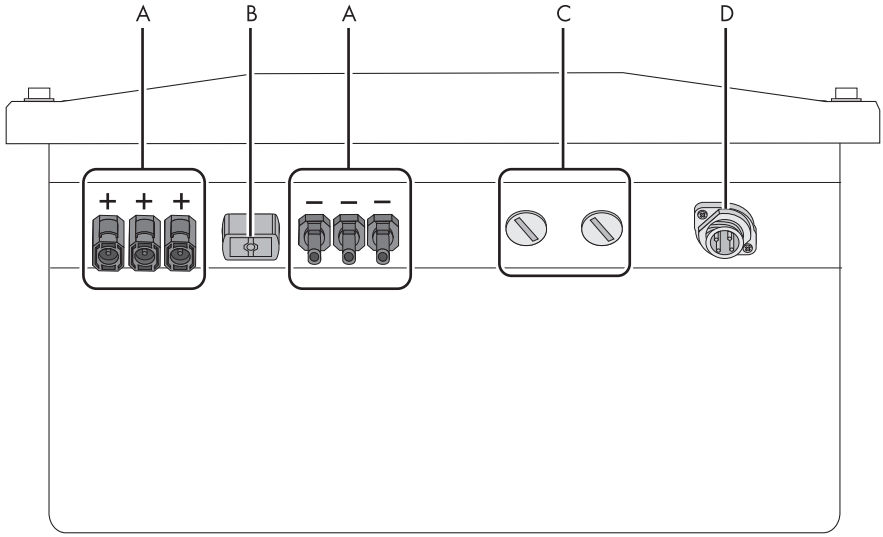
Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

5.1 Overview of the Connection Area

5.1.1 Exterior View

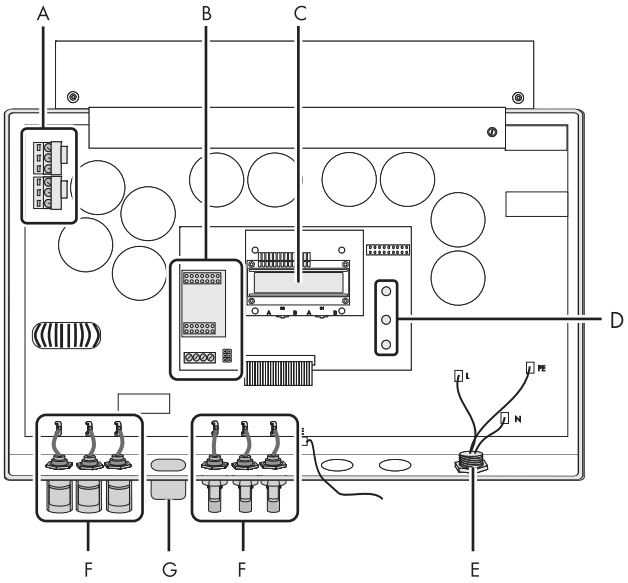
The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



Object	Description
A	DC connectors for connecting the PV strings
B	Socket for connecting the Electronic Solar Switch (ESS) DC load disconnection unit
C	Enclosure opening with filler-plugs for communication
D	Socket for AC connection

5.1.2 Interior View

The following figure shows the various components and connection areas of the open inverter.



Object	Description
A	Varistors
B	Connection area and sockets for the optional communication via RS485.
C	Display
D	Operating status LEDs
E	Socket for AC connection
F	DC connector
G	Electronic Solar Switch (ESS) socket

5.2 Connection to the Power Distribution Grid (AC)

5.2.1 Conditions for the AC Connection

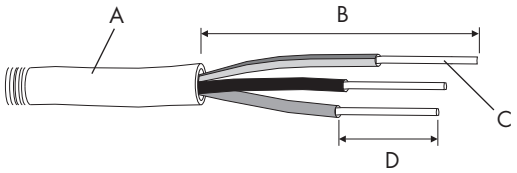
Connection requirements of the distribution grid operator

Comply with the connection requirements of your distribution grid operator

Cable Dimensioning

Use "Sunny Design" version 2.0 or higher for the dimensioning of the conductor cross-sectional areas (see "Sunny Design" design program at www.SMA.de/en).

Cable Requirements



Position	Description	Value
A	External diameter	9 mm ... 17 mm
B	Stripping length	30 mm
C	Conductor cross-section	max. 2.5 mm²
D	Stripped insulation	4 mm ... 5 mm

Load Disconnection Unit

You must install a **separate** miniature circuit-breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible rating can be found in section 11 "Technical Data" (page 60).

Detailed information and examples for the rating of a miniature circuit-breaker can be found in the Technical Information "Miniature Circuit-Breaker" in the SMA Solar Technology AG download area at www.SMA.de/en.

DANGER!

Danger to life due to fire.

When more than one inverter is connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

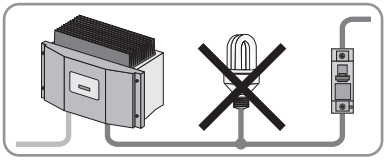
- Never connect several inverters to a single miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the miniature circuit-breaker.

DANGER!

Danger to life due to fire.

When a generator (inverter) and a load are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The current from the inverter and the grid can accumulate to excessive current that is not detected by the miniature circuit-breaker.

- Never connect consumers between the inverter and the miniature circuit-breaker without protection.
- Always protect consumers separately.



NOTICE!

Damage to the inverter by using screw type fuse elements as a load disconnection unit.

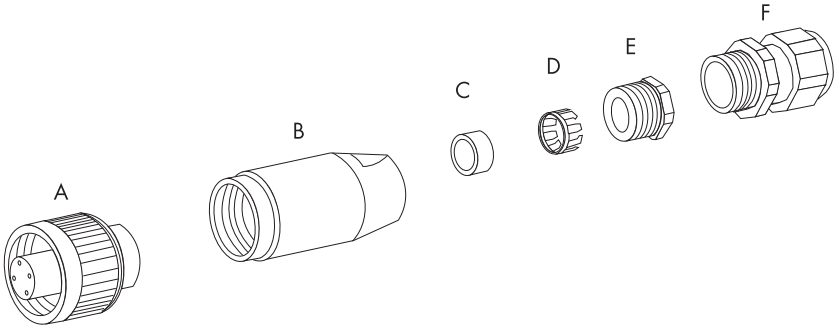
A screw type fuse element, e.g. D system (Diazed) or D0 system (Neozed), is not a load disconnection device, and thus may **not** be used as a load disconnection unit. A screw type fuse element serves as cable protection only.

When disconnecting under load using a screw type fuse element, the inverter can be damaged.

- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

5.2.2 Connecting the Inverter to the Power Distribution Grid (AC)

Overview of the AC Connection Socket

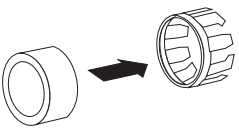
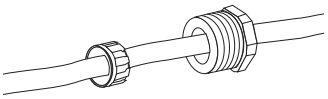
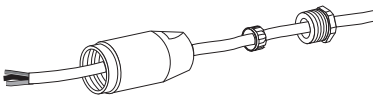
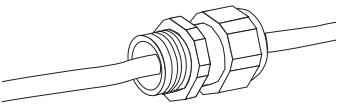
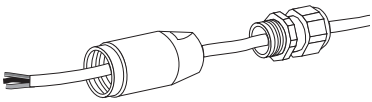


Object	Description
A	Socket element
B	Threaded sleeve
C	PG13.5 sealing ring
D	PG13.5 fastening case
E	Pressure screw for PG 13.5 (for a cable diameter between 9 mm ... 13.5 mm)
F	Cable gland PG 16 (for a cable diameter between 13.5 mm ... 17 mm)

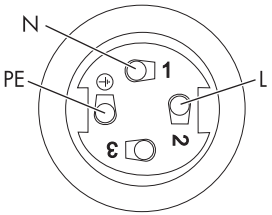
Procedure

1. Choose an appropriate gland for the AC cable.
2. Check the grid voltage and compare with "$V_{AC\ nom}$" on the type label.

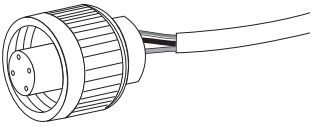
   The exact operating range of the inverter is specified in the operation parameters. The corresponding document can be found in the download area at www.SMA.de/en, in the "Technical Description" category of the respective inverter.
3. Switch off the miniature circuit-breaker, ensure that the device cannot be unintentionally or accidentally reconnected, and make sure no voltage is present.
4. Strip approx. 30 mm from the AC cable.
5. Shorten L and N by 5 mm.
6. Strip 4 mm to 5 mm of insulation from the AC cable conductors.
7. Pass the pressure screw and/or cable gland and socket tube over the AC cable.

Size used	Procedure
PG13.5	• Push the sealing ring into the fastening case.  • Slide the PG13.5 pressure screw and the fastening case including the sealing ring over the AC cable.  • Slide the threaded sleeve over the AC cable. 
PG16	• Slide the PG16 cable gland over the AC cable.  • Slide the threaded sleeve over the AC cable. 

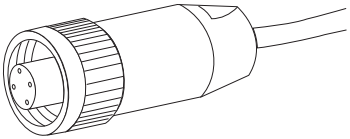
8. Insert the protective conductor PE (green-yellow) into the screw terminal with the grounding sign on the socket and tighten the screw.
9. Insert the neutral conductor N (blue) into screw terminal 1 on the socket and tighten the screw.
10. Insert phase L (brown or black) into screw terminal 2 on the socket and tighten the screw.
11. Leave screw terminal 3 on the socket free.



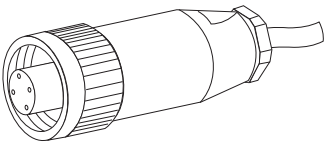
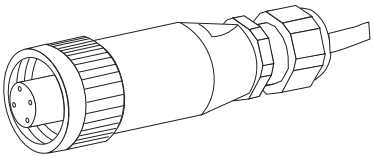
12. Make sure the wires are securely connected.



13. Screw the threaded sleeve onto the socket element.



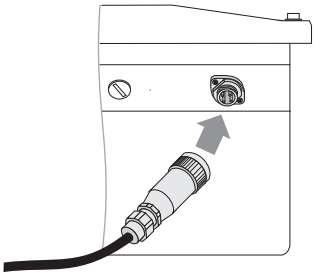
14. Tighten the pressure screw or cable gland tightly onto the threaded sleeve.

Size used	Procedure
PG13.5	 The fastening case along with the sealing ring is pressed into the threaded sleeve and can no longer be seen.
PG16	• Retighten the lock nut of the cable gland. 

☑ AC connection socket has been screwed together.

15. If the AC connection socket is not immediately connected to the inverter, close the AC plug on the inverter with the protective cap provided.

16. Insert the AC connection socket into the AC socket on the inverter. Remove the protective cap beforehand, if required.
17. Screw the threaded ring of the AC connection socket tightly onto the AC socket on the inverter. The threaded ring serves to seal and relieve strain on the AC connection socket.



☑ The AC cable is now connected to the inverter.

DANGER!

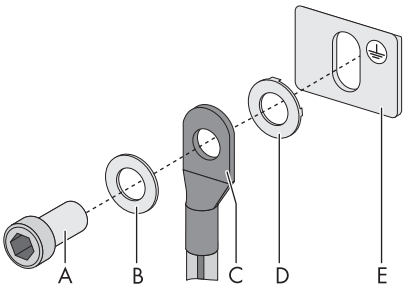
Danger to life due to high voltages in the inverter.

- Do not switch on the miniature circuit-breaker until the PV array has been connected and the inverter is securely closed.

5.2.3 Connecting Additional Grounding

If a second protective conductor, additional grounding or equipotential bonding is required, you can additionally ground the inverter on the enclosure.

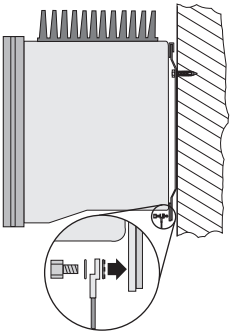
Overview of the Additional Grounding



Object	Description
A	M6x12 cylinder head screw (included in the scope of delivery)
B	Washer
C	Terminal lug (M6) with protective conductor
D	Conical spring washer (included in the scope of delivery)
E	Metal shackle on the underside of the enclosure
F	Wall mounting bracket of the inverter

Procedure

1. Attach the washer, terminal lug with protective conductor and the conical spring washer to the cylinder head screw. The teeth of the conical spring washer must be facing the metal shackle.
2. Insert the cylinder head screw into the metal shackle on the underside of the enclosure and screw into the wall mounting bracket. Tighten the cylinder head screw using a torque of 6 Nm.
3. Check that the contact between the protective conductor and the enclosure is in accordance with the regulations valid for the country of installation.

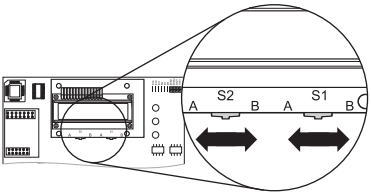


5.3 Setting the Display Language

You can set the language of the display using the switches underneath the display assembly inside the inverter.

Procedure

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 42).
2. Set the switches to the required language, as shown below.



Language	Switch S2	Switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A

The following switch settings apply for type SB 2500-IT/3000-IT inverters:

Language	Switch S2	Switch S1
Italian	B	A
English	A	A

3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).

☑ The display language is set.

5.4 PV Array Connection (DC)

5.4.1 Conditions for the DC Connection

Use of adaptors

Adaptors (branch connectors) must not be visible or freely accessible in the immediate surroundings of the inverter.

- The DC circuit must not be interrupted by adaptors.
- Observe the procedure for disconnecting the inverter as described in section 7.2 "Opening the Inverter" (page 42).

- Requirements for the PV modules of the connected strings:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connecting cables of the PV modules must be equipped with plug connectors. You will find the necessary DC connectors for DC connection in the delivery.
- The following limit values at the DC input of the inverter must not be exceeded:

Inverter	Maximum input voltage	Maximum input current
SB 2500 **SB 2500-IT**	600 V (DC)	12.0 A (DC)
SB 3000 **SB 3000-IT**	600 V (DC)	12.0 A (DC)

DANGER!

Risk of lethal electric shock or fire.

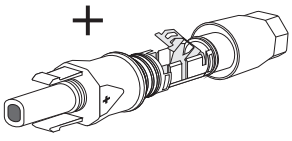
The maximum possible input current per string is limited by the plug connectors used. If the plug connectors are overloaded, an electric arc may occur and there is a risk of fire.

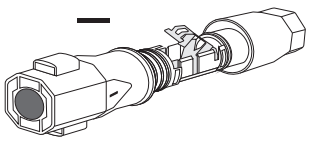
- Ensure that the input current for each string does not exceed the maximum flow current of the plug connectors used.

5.4.2 Assembling the DC Plug Connector

In order to be connected to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

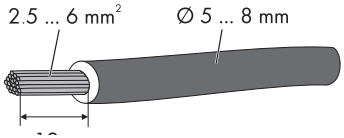
To assemble the DC connectors, proceed as follows. Ensure the plug connectors have the correct polarity. The DC connectors have the symbols "+" and "–".





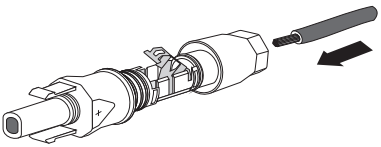
Cable requirements:

- Use a PV1-F cable.

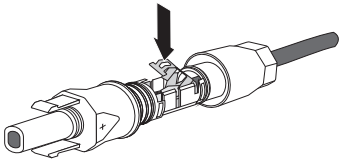


Procedure

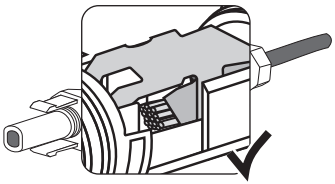
1. Insert stripped cable into the plug up to the limit.

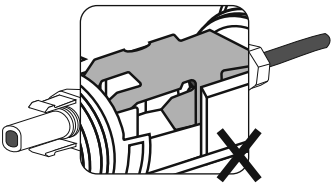
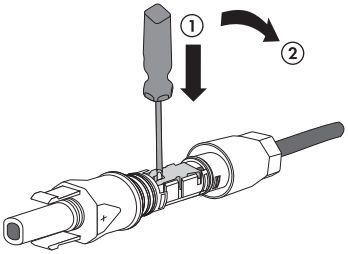


2. Press the clamping clip down until it audibly snaps into place.

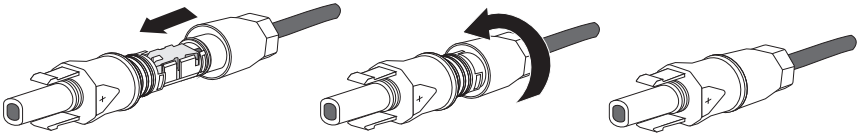


3. Ensure the cable is correctly in place.

Result	Measure
☑ If the conductors are visible in the hollow cavity of the clamping clip, the cable is in the correct position. 	• Proceed to step 4.

Result	Measure
☑ If the conductors are **not** visible in the hollow cavity, the cable is not in the correct position. 	• Declamp the clamping clip. For this purpose, use a screwdriver with a width of 3.5 mm.  • Remove cable and start again from step 1.

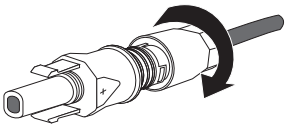
4. Push the bolted connection toward the thread and fasten to a torque of 2 Nm.



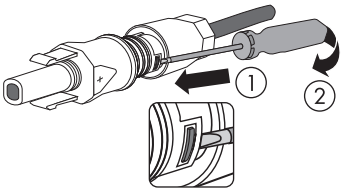
☑ The DC connectors are now assembled and can be connected to the inverters, as described in section 5.4.4 "Connecting the PV Array (DC)" (page 31).

5.4.3 Opening the DC Connector

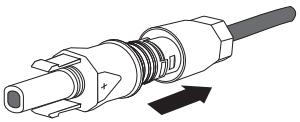
1. Unscrew the threaded joint.



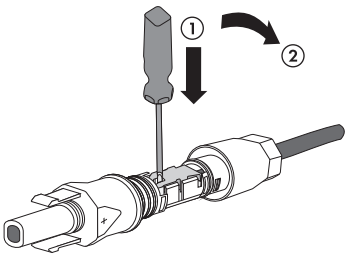
2. To release the plug connector, slot a screw driver into the side catch mechanism and lever out. For this purpose, use a screwdriver with a width of 3.5 mm.



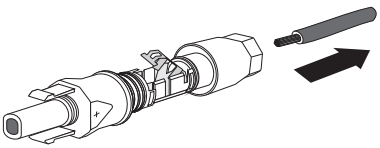
3. Carefully pull the DC connector apart.



4. Declamp the clamping clip. For this purpose, use a screwdriver with a width of 3.5 mm.



5. Remove the cable.



☑ The cable is now removed from the DC connector.

5.4.4 Connecting the PV Array (DC)

DANGER!

Danger to life due to high voltages in the inverter.

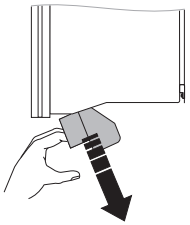
- Before connecting the PV array, ensure that the miniature circuit-breaker is switched off.

NOTICE!

Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

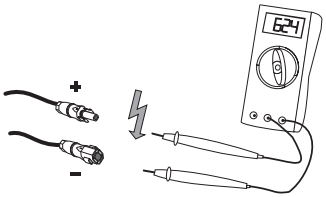
1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.



3. Check the connection cables of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

   At an ambient temperature above 10 °C, the open circuit voltage of the PV modules must not be more than 90 % of the maximum inverter input voltage.

   Otherwise, check the system design and the PV module connection. If this is not done, the maximum inverter input voltage can be exceeded at low ambient temperatures.



NOTICE!

Exceeding the maximum input voltage can destroy the inverter.

If the voltage of the PV modules exceeds the maximum input voltage of the inverter, it can be destroyed by the overvoltage.

This will void all warranty claims.

- Do not connect strings with an open-circuit voltage greater than the maximum input voltage of the inverter.
- Check the system design.

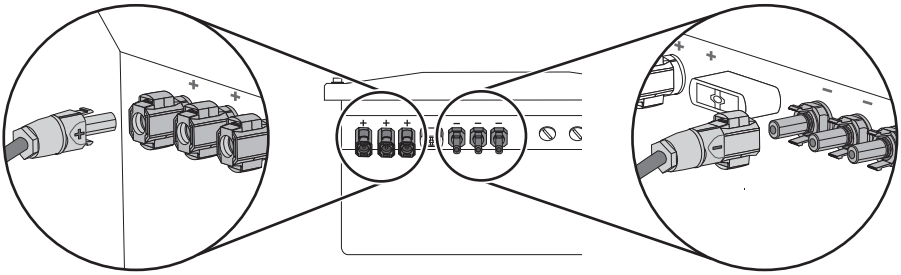
4. Check the strings for ground faults, as described in section 9.3.1 "Checking the PV Array for a Ground Fault" (page 54).

DANGER!

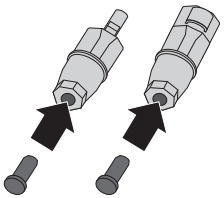
Risk of lethal electric shock.

- Do not connect strings with ground faults.
- First, rectify the ground fault in the respective string.

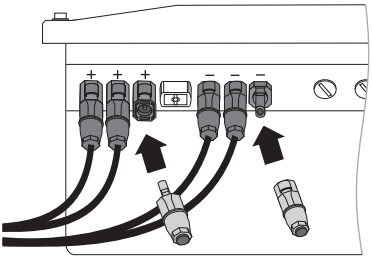
5. Check the DC connector for correct polarity and connect it. To release the DC connectors, see section 7.2 "Opening the Inverter" (page 42).



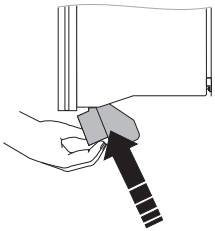
6. In order to seal the inverter, all the DC inputs that are not required have to be closed as follows:
   - Insert the provided sealing plugs into the DC connectors that are not needed.
     Do **not** insert the sealing plugs into the DC inputs on the inverter.



– Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.



7. Check the Electronic Solar Switch for wear, as described in section 8.1 "Checking the Electronic Solar Switch for Wear" (page 47) and reattach it firmly.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch.

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

NOTICE!

The Electronic Solar Switch can be damaged if it is attached incorrectly.

If it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the socket of the Electronic Solar Switch.
- Check that the handle is securely in place.

☑ The PV array is now connected.

5.5 Communication

The inverter is equipped with a socket for communication interfaces in order to communicate with special data acquisition devices (e.g., Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control or Sunny Explorer).

Refer to the communication interface manual for a detailed wiring diagram and a mounting description.

5.6 Setting the Grid and Country Parameters

Changing grid-relevant and country parameters

To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is available in the download area at www.SMA.de/en, in the "Certificate" category of the respective inverter.

Ensure that you discuss the changes to these parameters with your distribution grid operator.

A detailed description of the operation parameters for the inverter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

5.6.1 Setting the Installation Country

Using the "Default" parameter you can set the installation country and/or the grid connection standard valid for the country via a communication device (e.g., Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the default standard to which the inverter was set on the type label and on the included supplementary document with the factory settings.

5.6.2 Setting Stand-Alone Grid Operation

To operate the inverter in an off-grid system with Sunny Island, you must set the "Default" parameter to stand-alone grid ("OFF-Grid") operation.

You have several possibilities to set the inverter to stand-alone grid operation:

- Setting via Sunny WebBox

  or

- Setting via Sunny Data Control or Sunny Explorer

DANGER!

Danger to life due to high voltages in the event of outage of the power distribution grid.

If you set the inverter to stand-alone grid operation, it does not fulfill any country-specific standards and guidelines. Therefore, in the event of outage of the power distribution grid, there is a danger of feedback.

- **Never** operate the inverter directly on the power distribution grid when set to stand-alone grid operation.

6 Commissioning

6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
   - The inverter is securely in place.
   - Correct connection of the AC cable (grid)
   - Complete connection of all DC cables (PV strings)
   - Unnecessary DC inputs are closed with the corresponding DC connectors and sealing plugs.
   - The enclosure lid is securely screwed in place.
   - The Electronic Solar Switch is securely plugged.
   - The miniature circuit-breaker is rated correctly.
2. Switch on the miniature circuit-breaker.

   ☑ Green LED glows: commissioning has been successful.

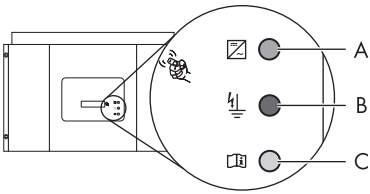
   or

   ☑ Green LED flashes in case of insufficient irradiation: grid connection conditions have not yet been reached. Wait for sufficient irradiation.

   or

   ☑ The red or yellow LED is glowing or flashing: a disturbance has occurred. Proceed to step 3.

A	Green LED	Operation
B	Red LED	Ground fault or varistor defective
C	Yellow LED	Fault



Self test in accordance with DK 5940, Ed. 2.2 for initial commissioning (applies to Italy only)

The Italian DK 5940 standard prescribes that an inverter can only operate on the power distribution grid after the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

Start the self-test as described in section 6.2 "Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)" (page 37). The test takes approx. 8 minutes.

3. Read section 9 "Failure Search" (page 49) and if necessary eliminate the fault or disturbance.

6.2 Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)

6.2.1 Starting the Self-Test by Tapping

You can start testing the disconnection times by tapping on the enclosure lid. A prerequisite here is that the country configuration of the inverter has been set to Italy (IT/DK5940) or "trimmed". Proceed as follows for checking the disconnection times:

1. Connect the PV array to the inverter. The inverter can only initialize if the PV array produces enough power. It is therefore not possible to test the disconnection times at night.
2. Connect the inverter on the AC side. For this, you have to create the AC connection (AC plug or direct connection) and/or switch on the miniature circuit-breaker of the grid cable (fuse or automatic circuit breaker).
3. The inverter is now in the initialization phase, i.e. all 3 LEDs are glowing at the same time.

   Start the self-test **immediately** after all 3 LEDS have gone out by tapping on the display of the inverter.
4. The question of whether you would like to start the test sequence appears in the display. Tap on the display again within 30 seconds to confirm the question.

Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency one after the other. During the tests, the inverter shows the values in the display which are described in section 6.2.2 "Completion of the Self-Test" (page 37).

6.2.2 Completion of the Self-Test

Note the values which are displayed during the self-test. These values must be entered into a test report. The test results of the individual tests are displayed 3 times, one after the other. The respective display message is displayed for 10 seconds.

The self-test changes the upper and lower disconnection thresholds for each protective function on a linear basis with a modification of 0.05 Hz/s and 0.05 Vn/s for the frequency and voltage monitoring. As soon as the actual measured value is outside the permitted range (altered disconnection threshold), the inverter disconnects itself from the grid. In this way, the inverter determines the reaction time and checks itself.

Overvoltage Test

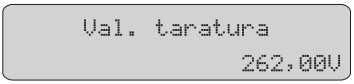
The inverter begins with the overvoltage test. During the test sequence, the voltage limit applied is shown in the display of the inverter.

The voltage limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the grid.

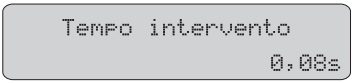
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value

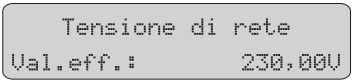
- Calibration value



- Reaction time



- Current grid voltage



Undervoltage Test

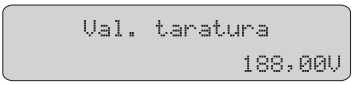
After the overvoltage test, the inverter performs the undervoltage test. During the test sequence, the current calibration value of the voltage limit applied is shown in the display of the inverter.

The voltage limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

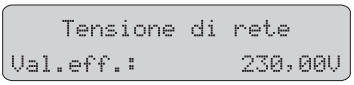
- Disconnection value

- Calibration value



- Reaction time

- Current grid voltage



Maximum Frequency

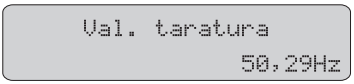
In a third step, the inverter tests the maximum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is reduced successively until the shutdown threshold is reached and the inverter disconnects from the grid.

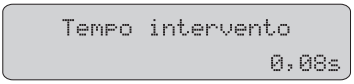
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value

- Calibration value



- Reaction time



- Current grid frequency

Minimum Frequency

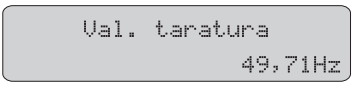
In the last step, the inverter tests the minimum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

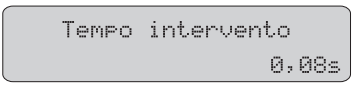
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value

- Calibration value



- Reaction time



- Current grid frequency

When the inverter has carried out the 4 tests, it switches to "MPP-Operation" mode. The original calibration values are then re-set and the inverter automatically connects to the grid. If you would like to carry out the test again, you must disconnect the inverter, i.e. disconnect it on the AC and DC sides and then later re-activate it. You can then restart the self-test as described in section 6.2.1 "Starting the Self-Test by Tapping" (page 37). The inverter starts again the test sequence, as described in section 6.2.2 "Completion of the Self-Test" (page 37).

7 Opening and Closing

7.1 Safety

DANGER!

Risk of lethal electric shock.

Before opening the inverter, observe the following:

- Ensure that no voltage is present on the AC side.
- Ensure that neither voltage nor current is present on the DC side.

NOTICE!

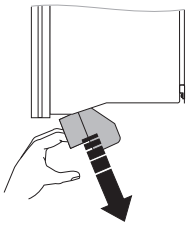
Electrostatic discharges can damage the inverter.

Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching a component.

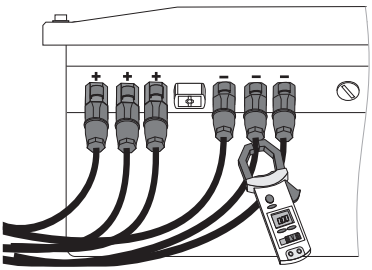
7.2 Opening the Inverter

1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.

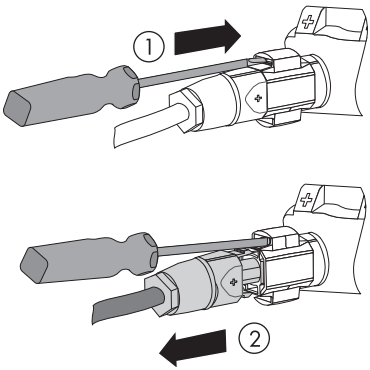


3. Using a current probe, ensure that no current is present at all DC cables.

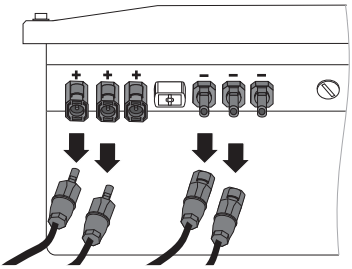
   ☑ If current is present, check the installation.



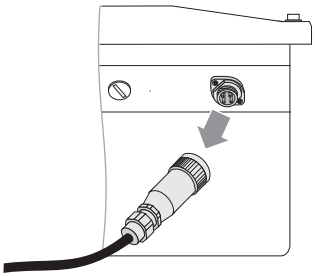
4. Unlock all DC connectors. For this purpose, use a screwdriver with a width of 3.5 mm.
   - Insert a screwdriver into one of the side slits (1).
   - Disconnect DC plug connectors (2).



☑ All DC connectors are disconnected from the inverter. The inverter is completely disconnected from the PV array.



5. Pull out the AC plug.



6. Check whether all LEDs and the display have gone out.

DANGER!

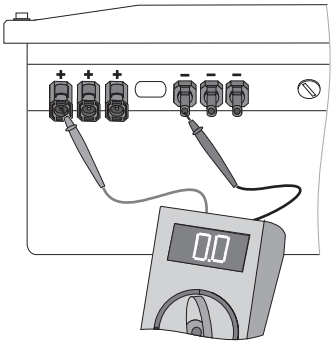
Danger to life due to high voltages in the inverter.

The capacitors in the inverter require 15 minutes to discharge.

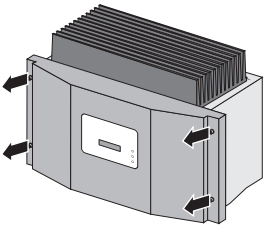
- Wait 15 minutes before opening the inverter.

7. Ensure that no voltage is present at the DC plugs on the inverter.

   ☑ If voltage is present, check the installation.



8. Remove all screws from the enclosure lid and pull the lid forward smoothly.

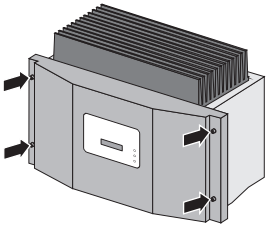


9. Remove protective conductor (PE) connection from the lid by loosening the PE connection lock on the lid.

☑ The inverter is now open and free of voltage.

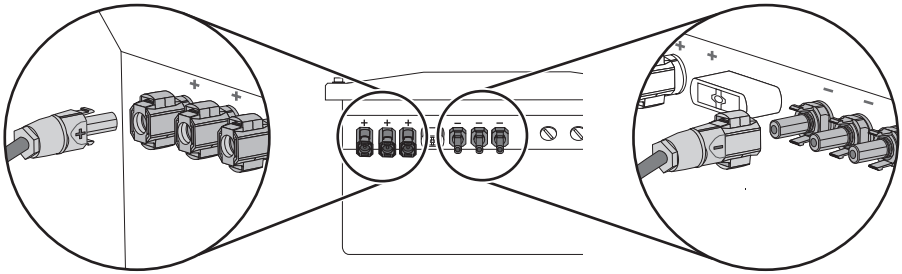
7.3 Closing the Inverter

1. Establish the protective conductor (PE) connection to the lid.
2. Secure the enclosure lid of the inverter by evenly tightening the 4 lid screws.

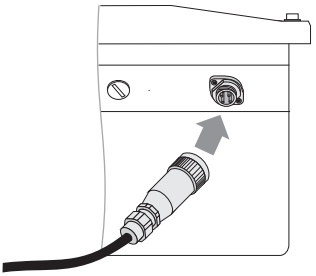


3. Check the DC connector for correct polarity and connect it.

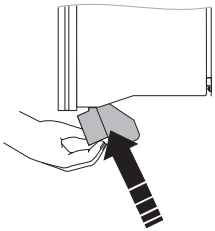
   To release the DC connectors, see section 7.2 "Opening the Inverter" (page 42).



4. Close all the DC inputs that are not needed as described in section 5.4.4 "Connecting the PV Array (DC)" (page 31) to seal the inverter.
5. Attach the AC plug.



6. Check the Electronic Solar Switch for wear, as described in section 8.1 "Checking the Electronic Solar Switch for Wear" (page 47) and reattach it firmly.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch.

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

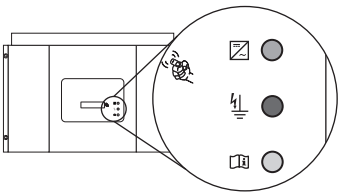
NOTICE!

The Electronic Solar Switch can be damaged if it is attached incorrectly.

If it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the socket of the Electronic Solar Switch.
- Check that the handle is securely in place.

7. Switch on the miniature circuit-breaker.
8. Check whether the display and the LEDs indicate a normal operating state (see section 6 "Commissioning" (page 36)).



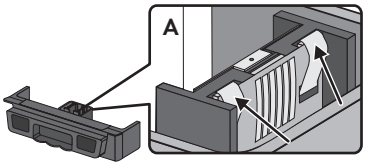
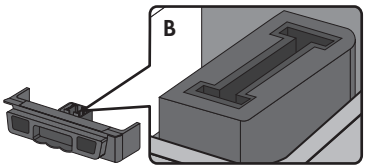
☑ The inverter is now closed and in operation.

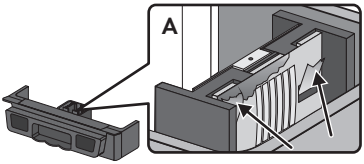
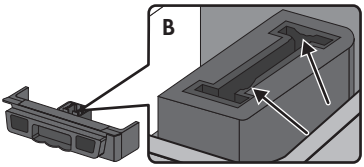
8 Maintenance and Cleaning

Impurities such as dust or airborne pollen can cause a buildup of heat that can lead to yield losses. Also check the inverters and the cables for visible external damage. Undertake repairs if necessary.

8.1 Checking the Electronic Solar Switch for Wear

Check the Electronic Solar Switch for wear before plugging it in. Depending on the shape of the Electronic Solar Switch, you can estimate the wear on either the metal tongues (shape A) or on the plastic (shape B).

Result	Measure
☑ The metal tongues in the Electronic Solar Switch are undamaged and not discolored (A).  **or** ☑ The plastic in the Electronic Solar Switch is undamaged (B). 	1. Securely attach the Electronic Solar Switch handle. 2. Commission the inverter as described in section 6 "Commissioning" (page 36).

Result	Measure
☑ The metal tongues in the Electronic Solar Switch have a brown discoloration or are burned through (A).  **or** ☑ The plastic in the Electronic Solar Switch shows thermal deformation (B). 	The Electronic Solar Switch can no longer reliably disconnect the DC supply. 1. Replace the Electronic Solar Switch handle before attaching it again (for the order number see section 12 "Accessories" (page 70). 2. Re-commission the inverter as described in section 6 "Commissioning" (page 36).

9 Failure Search

If the inverter displays other blink codes or fault messages than those described below, contact the SMA Serviceline.

You will also find a description of display messages during operation, status messages and measuring channels in the user manual provided.

Do not perform any repairs that are not described here and take advantage of the 24-hour replacement service (inverter ready for shipping and handed over to a freight-forwarding company within 24 hours) and the SMA Solar Technology AG repair service instead.

9.1 Blink Codes

Green	Red	Yellow	Status
is glowing continuously	is not glowing	is not glowing	OK (feed-in operation)
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing continuously	OK (initialization)
Flashes quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	is glowing continuously	is not glowing	Ground fault or varistor defective
Flashes slowly (1 x per second)	is not glowing	is not glowing	OK (waiting, grid monitoring)
	is glowing continuously	is not glowing	Ground fault or varistor defective
goes out briefly (approx. 1 x per second)	is not glowing	is not glowing	OK (derating)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is not glowing	is not glowing	is not glowing	At night: OK (nighttime deactivation) Daytime: Electronic Solar Switch is not attached
		is glowing/flashing	Fault
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing/flashing	Ground fault or varistor defective and disturbance

9.2 Fault Messages

When a disturbance occurs, the inverter generates a message which depends on the operating mode and the type of the detected disturbance.

Message	Description and corrective measure
!PV-Overvoltage! **!DISCONNECT DC!**	Overvoltage at DC input. Overvoltage can destroy the inverter.
	Corrective measures Disconnect the inverter from the grid immediately. 1. Turn off the miniature circuit-breaker. 2. Remove the Electronic Solar Switch. 3. Disconnect all the DC connectors. 4. Check the DC voltage: – If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer. – If the DC voltage is under the maximum input voltage, reconnect the PV array to the inverter as described in section 5.4 "PV Array Connection (DC)" (page 27). If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 71)).
ACVtgRPro	The 10-minute-average grid voltage is no longer within the permissible range. This can have the following causes: • The grid voltage at the connection point is too high. • The grid impedance at the connection point is too high. The inverter disconnects to assure compliance with the power quality of the grid.
	Corrective measures Check the grid voltage at the connection point of the inverter: • If, due to the local grid conditions, the grid voltage is 253 V or more, ask the distribution grid operator whether the voltage at the feed-in point can be adjusted, or whether they would agree to an alteration of the limit value ACVtgRPro parameter for power quality monitoring. • If the grid voltage is continually within the tolerance range and this fault message is still displayed, contact the SMA Serviceline.
Bfr-Srr	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this disturbance occurs frequently, contact the SMA Serviceline.

Message	Description and corrective measure
EEPROM	Transition disturbance while data is being written or read from EEPROM. The data is not relevant for safe operation. The disturbance has no effect on the performance of the inverter.
EEPROM dBh	EEPROM data is defective, the device has switched off because the loss of data has disabled important functions of the inverter.
	Corrective measures • Contact the SMA Serviceline.
EeRestore	One of the duplicate data sets in the EEPROM is defective and has been reconstructed without loss of data. • This fault message only serves to inform you and has no effect on the performance of the inverter.
Fac-Bfr **Fac-Srr** **FacFast**	The grid frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). For safety reasons, the inverter disconnects itself from the grid.
	Corrective measures • Check the grid connection and contact the distribution grid operator if necessary. • If the power frequency is within the tolerable range, but "Fac-Bfr," "Fac-Srr" "FacFast" disturbances are still displayed, contact the SMA Serviceline.
Imax/overcurrent	Overcurrent on the AC side. This message is displayed if the current on the AC grid is larger than specified.
	Corrective measures • Check the system design and grid conditions.
K1-Close **K1-Open**	Fault during relay test.
	Corrective measures • If this fault frequently occurs or occurs several times consecutively, contact the SMA Serviceline.
MSD-Fac **MSD-Vac** **MSD-Timeout**	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this disturbance occurs frequently, contact the SMA Serviceline.
Offset	The "Offset" operating state is a normal operating condition that occurs prior to grid monitoring. If "Offset" is displayed as a fault, then there is a disturbance in the data logging.
	Corrective measures • If this disturbance occurs frequently, contact the SMA Serviceline.

Message	Description and corrective measure
Riso	The electrical insulation between the PV plant and ground is faulty. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.
	Corrective measures • Check the system insulation. • Check the system for ground faults as described in section 9.3.1 "Checking the PV Array for a Ground Fault" (page 54).
ROM	The inverter's firmware is faulty.
	Corrective measures • If this disturbance occurs frequently, contact the SMA Serviceline.
Shutdown	Temporary inverter disturbance.
	Corrective measures • Contact the SMA Serviceline.
Vac-Bfr **Vac-Srr**	The grid voltage is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). This fault can be caused by any of the following conditions: • Grid disconnected (miniature circuit-breaker, fuse) • AC cable is broken or • AC cable is highly resistive For safety reasons, the inverter disconnects itself from the grid.
	Corrective measures • Check the grid voltage and connection on the inverter. • If the grid voltage lies outside the acceptable range because of local grid conditions, ask the distribution grid operator if the voltages can be adjusted at the feed-in point or if they agree to changes in the values of the monitored operational limits (operation parameters: Vac-Min and Vac-Max). • If the grid voltage lies within the tolerance range, yet "Vac-Bfr" or "Vac-Srr" faults are still displayed, contact the SMA Serviceline.

Message	Description and corrective measure
Vpv-Max	Overvoltage at DC input. The inverter could be damaged.
Vpv-Max	**Corrective measures** Immediately disconnect the inverter from the grid. 1. Turn off the miniature circuit-breaker. 2. Remove the Electronic Solar Switch. 3. Disconnect all the DC connectors. 4. Check the DC voltage: – If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer. – If the DC voltage is under the maximum input voltage, reconnect the PV array to the inverter as described in section 5.4 "PV Array Connection (DC)" (page 27). If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 71)).
Watchdog	Internal program run disturbance.
Watchdog-Srr	**Corrective measures** • If this disturbance occurs frequently, contact the SMA Serviceline.

9.3 Red LED is Glowing Continuously

If the red status display LED lights up continuously during operation, there is a ground fault in the PV array, at least one varistor for overvoltage protection is defective or there is an insulation fault.

Procedure

1. Check for ground faults in the PV array as described in section 9.3.1 "Checking the PV Array for a Ground Fault" (page 54).
2. If the red LED continues to glow, check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 56).

9.3.1 Checking the PV Array for a Ground Fault

1. Disconnect the inverter from both the DC and AC connections as described in section 7.2 "Opening the Inverter" (page 42).

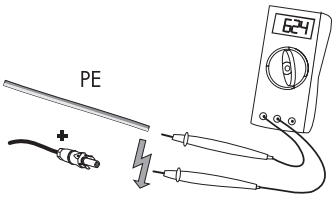
DANGER!
Risk of lethal electric shock.

- Only touch the cables of the PV array on their insulation.
- Do not connect strings with ground faults to the inverter.

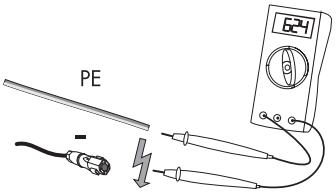
NOTICE!
Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

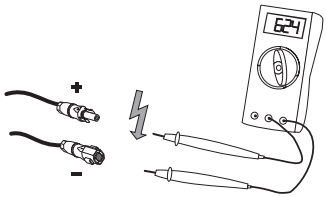
2. Measure the voltages between the plus pole of each string and the ground potential (PE).



3. Measure the voltages between the minus pole of each string and the ground potential (PE).



4. Measure the voltages between the plus pole and the minus pole of each string.



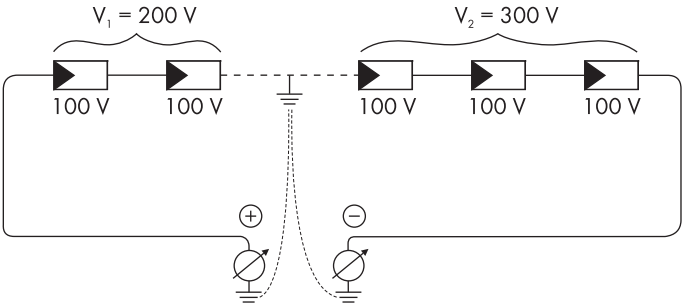
☑ A ground fault exists if the measured voltages are stable and the sum of the voltages from the plus pole to the ground potential and from the minus pole to the ground potential of a string are almost the same as the voltage between the plus and minus poles.

Result	Measure
☑ You have found **a ground fault**.	• The installer of the PV array must remedy the ground fault in the affected string. You can determine the location of the ground fault as described below. • Do **not** reconnect the faulty string. • Commission the inverter as described in section 6.1 "Commissioning the Inverter" (page 36).
☑ You have found **no ground fault**.	It is likely that one of the thermally monitored varistors is defective. • Check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 56).

Location of the ground fault

The approximate position of the ground fault can be determined from the ratio of the measured voltages between the plus pole against ground potential and the minus pole against ground potential (PE).

Example:



In this case, the ground fault is between the second and third PV modules.

☑ The ground fault check is finished.

9.3.2 Checking the Function of the Varistors

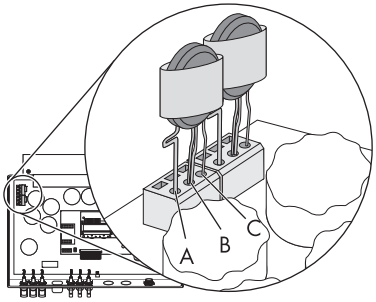
Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function, and thus the red LED is lit.

Position of varistors

You can determine the position of the varistors using the illustration below.

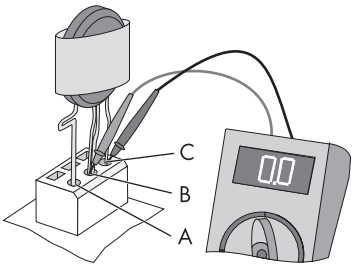
Observe the following assignment of the terminals:

- Terminal A: outer terminal (varistor connection **with loop** [crimp])
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without loop** [crimp]).



Check the function of the varistors as described below:

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 42).
2. Using a multimeter and with both varistors installed, determine whether there is a conductive connection between terminals B and C.



Result	Measure
☑ There is a **conducting** connection.	There is probably a different fault in the inverter. • Contact the SMA Serviceline (see section 13 "Contact" (page 71)).

Result	Measure
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors. The varistors are specially manufactured for use in the inverter and are not commercially available. They must be ordered directly from SMA Solar Technology AG (see section 12 "Accessories" (page 70)). • To replace the varistors, proceed to step 3.

NOTICE!

Destruction of the inverter due to overvoltage.

If varistors are missing, the inverter is no longer protected against overvoltages.

- Replacement varistors should be obtained as soon as possible.
- Do **not** operate the inverter without varistors in plants with a high risk of overvoltages.

3. Insert an insertion tool into the openings of the terminal contacts (1).

   ☑ The terminals will loosen.

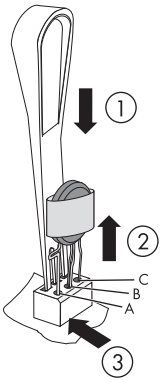
   If you do not receive an insertion tool for operating the terminals with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the individual terminal contacts can be operated using a 3.5 mm wide screwdriver.

4. Remove varistor (2).
5. Insert new varistor (3).

   The pole with the small loop (crimp) must be fitted to terminal 1 when replacing the varistor.

6. Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).

☑ The check and replacement of the varistors is completed.



10 Decommissioning

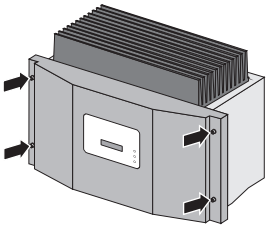
10.1 Disassembling the Inverter

CAUTION!

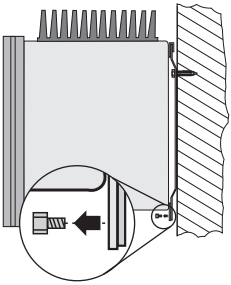
Risk of injury due to the heavy weight of the inverter.

- Note that the inverter weighs approx. 32 kg.

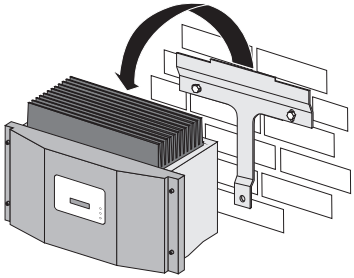
1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 42).
2. Remove all cables from the inverter.
3. Close the inverter with the 4 screws.



4. Loosen the lower screw between the inverter and the wall mounting bracket.



5. Lift the inverter off the wall mounting bracket.



☑ The inverter is disassembled.

10.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent carton. The box must be capable of being closed completely and made to support both the weight and the size of the inverter.

10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between –25 °C and +60 °C.

10.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("FOR DISPOSAL") (see section 13 "Contact" (page 71)).

11 Technical Data

11.1 Sunny Boy 2500

DC Input

Maximum DC power at cos φ = 1	2 700 W
Maximum input voltage*	600 V
MPP voltage range	224 V ... 480 V
Rated input voltage	300 V
Minimum input voltage	224 V
Start input voltage	300 V
Maximum input current	12 A
Maximum input current per string	12 A
Number of independent MPP inputs	1
Strings per MPP input	3

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

AC Output

Rated output power at 230 V, 50 Hz	2 300 W
Maximum apparent AC power	2 500 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	160 V ... 265 V
AC nominal current at 220 V	10.5 A
AC nominal current at 230 V	10.0 A
AC nominal current at 240 V	9.6 A
Maximum output current	12.5 A
Total harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC rated power	≤ 3 %
Rated grid frequency	50 Hz
AC power frequency	50 Hz / 60 Hz
Operating range at AC grid frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC grid frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed phases	1
Connection phases	1

Overvoltage category according to IEC 60664-1	III
Maximum cable length at cable diameter of 1.5 mm²	9 m
Maximum cable length at cable diameter of 2.5 mm²	15.5 m

Protection devices

DC reverse-polarity protection	Short circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	16.0 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 1 MΩ
Galvanic isolation	Available

General data

Width x height x depth with Electronic Solar Switch	440 mm x 339 mm x 214 mm
Weight	28 kg
Length x width x height of packaging	532 mm x 392 mm x 318 mm
Transport weight	33.1 kg
Climatic category according to IEC 60721-2-1	4K4H
Operation temperature range	– 25 °C ... +60 °C
Maximum permissible value for relative humidity, non-condensing	100 %
Maximum operating altitude above mean sea level	2 000 m
Noise emission (typical)	≤ 33 dB(A)
Power loss in night operation	≤ 0.25 W
Topology	LF transformer
Cooling concept	Convection
Electronics degree of protection according to IEC 60529	IP65

Country standards, as of 02/2011*	VDE0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 PPC EN 50438 RD1663 RD661 G83/1-1 DK5940

* EN 50438: does not apply to all country standard deviations of EN 50438.
DK 5940: only applies for SB 2500-IT.

Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 25 °C ... +60 °C
Extended humidity range	0 % ... 100 %
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3

Temperature range	– 25 °C ... +70 °C

Features

DC connection	SUNCLIX DC connector
AC Connection	AC connector
Display	LC text display
Bluetooth® Wireless Technology	Optional
RS485, galvanically isolated	Optional

Electronic Solar Switch

Electrical service life in the event of a short circuit, with a nominal current of 35 A	a minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

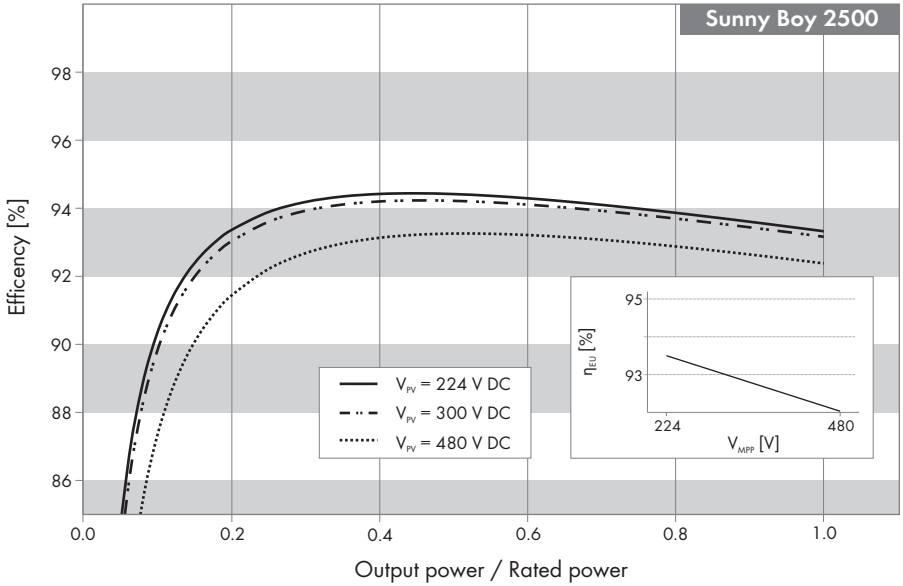
Torque

Enclosure lid screws	6.0 Nm
Additional grounding screw	6.0 Nm
Cylinder head screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm

Grid Forms

IT grid	Suitable
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable
Split Phase	Suitable

Efficiency



Maximum efficiency, η_{max}	94.1 %
European weighted efficiency, η_{EU}	93.2 %

Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage 224 V	Rated input voltage 300 V	Maximum MPP voltage 480 V
5 %	84.0 %	83.2 %	79.5 %
10 %	90.3 %	89.8 %	87.3 %
20 %	93.4 %	93.0 %	91.4 %
25 %	93.9 %	93.6 %	92.2 %
30 %	94.1 %	93.9 %	92.7 %
50 %	94.1 %	94.1 %	93.3 %
75 %	94.0 %	93.8 %	93.0 %
100 %	93.3 %	93.2 %	92.4 %

11.2 Sunny Boy 3000

DC Input

Maximum DC power at cos φ = 1	3 200 W
Maximum input voltage*	600 V
MPP voltage range	268 V ... 480 V
Rated input voltage	350 V
Minimum input voltage	268 V
Start input voltage	330 V
Maximum input current	12 A
Maximum input current per string	12 A
Number of independent MPP inputs	1
Strings per MPP input	3

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

AC Output

Rated output power at 230 V, 50 Hz	2 750 W
Maximum apparent AC power	3 000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	160 V ... 265 V
AC nominal current at 220 V	12.5 A
AC nominal current at 230 V	12.0 A
AC nominal current at 240 V	11.5 A
Maximum output current	15.0 A
Total harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC rated power	≤ 3 %
Rated grid frequency	50 Hz
AC power frequency	50 Hz / 60 Hz
Operating range at AC grid frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC grid frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed phases	1
Connection phases	1

Overvoltage category according to IEC 60664-1	III
Maximum cable length at cable diameter of 2.5 mm²	12.5 m

Protection devices

DC reverse-polarity protection	Short circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	16.0 A
Ground fault monitoring	Insulation monitoring: $R_{iso} > 1$ MΩ
Galvanic isolation	Available

General data

Width x height x depth with Electronic Solar Switch	440 mm x 339 mm x 214 mm
Weight	32 kg
Length x width x height of packaging	532 mm x 392 mm x 318 mm
Transport weight	36.6 kg
Climatic category according to IEC 60721-2-1	4K4H
Operation temperature range	– 25 °C ... +60 °C
Maximum permissible value for relative humidity, non-condensing	100 %
Maximum operating altitude above mean sea level	2 000 m
Noise emission (typical)	≤ 30 dB(A)
Power loss in night operation	≤ 0.25 W
Topology	LF transformer
Cooling concept	Convection
Electronics degree of protection according to IEC 60529	IP65

Country standards, as of 02/2011*	VDE0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 PPC EN 50438 RD1663 RD661 G83/1-1 DK5940

* EN 50438: does not apply to all country standard deviations of EN 50438.
DK 5940: only applies for SB 3000-IT.

Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 25 °C ... +60 °C
Extended humidity range	0 % ... 100 %
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3

Temperature range	– 25 °C ... +70 °C

Features

DC connection	SUNCLIX DC connector
AC Connection	AC connector
Display	LC text display
Bluetooth	Optional
RS485, galvanically isolated	Optional

Electronic Solar Switch

Electrical service life in the event of a short circuit, with a nominal current of 35 A	a minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

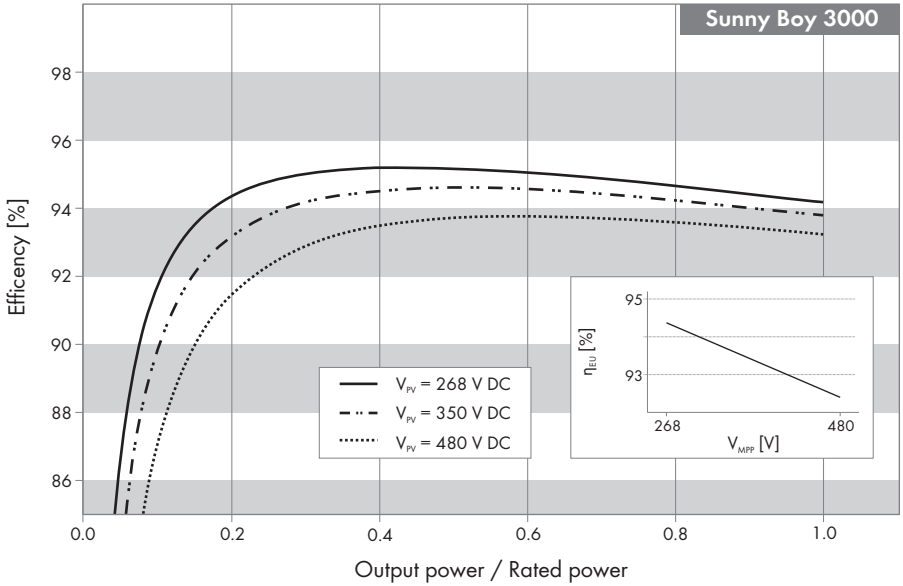
Torque

Enclosure lid screws	6.0 Nm
Additional grounding screw	6.0 Nm
Cylinder head screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm

Grid Forms

IT grid	Suitable
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable
Split Phase	Suitable

Efficiency



Maximum efficiency, η_{max}	95.0 %
European weighted efficiency, η_{EU}	93.6 %

Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage 268 V	Rated input voltage 350 V	Maximum MPP voltage 480 V
5 %	86.1 %	83.0 %	78.9 %
10 %	91.7 %	89.8 %	87.0 %
20 %	94.3 %	93.2 %	91.4 %
25 %	94.8 %	93.8 %	92.3 %
30 %	95.0 %	94.2 %	92.9 %
50 %	95.0 %	94.6 %	93.7 %
75 %	94.8 %	94.3 %	93.7 %
100 %	94.2 %	93.8 %	93.3 %

12 Accessories

You will find the corresponding accessories and replacement parts for your product in the following overview. If required, you can order these from SMA Solar Technology AG or your dealer.

Description	Brief Description	SMA order number
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:01 Also enter the inverter's serial number.
Replacement varistors	Set of thermally monitored varistors (2 pcs.) including insertion tool	SB-TV4
Insertion tool for replacing the varistors	Insertion tool for varistor sets	SB-TVWZ
Positive grounding set	Upgrade kit for the positive connection to ground of the DC input	ESHV-P-NR
Negative grounding set	Upgrade kit for the negative connection to ground of the DC input	ESHV-N-NR
RS485 upgrade kit	RS485 interface	485PB-NR
Bluetooth upgrade kit	*Bluetooth* interface	BTPBINV-NR
SUNCLIX DC connector	Field plug for conductor cross-sections of 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

13 Contact

If you have technical problems concerning our products, contact the SMA Serviceline. We need the following information in order to provide you with the necessary assistance:

- Inverter type
- Serial number of inverter
- Type and number of the PV modules connected
- Optional equipment, e.g. communication devices
- Blink code or display message of the inverter

SMA Solar Technology AG

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SMA Serviceline

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